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Theoretical:

Histogram Equalization (Lecture 2)

Q1: Consider images of size 12x12 with pixel values ranging from 0 to 15. For the following image histograms, estimate the mapped intensity values after histogram equalization.

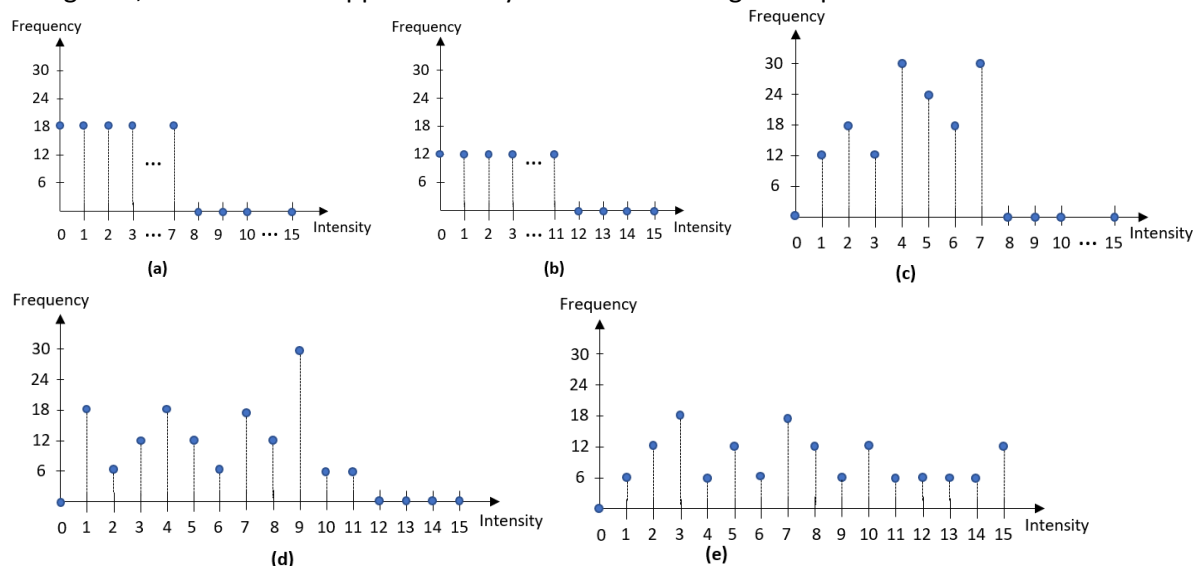


Figure 1

Original Intensity	Intensity after histogram equalization				
	(a)	(b)	(c)	(d)	(e)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Filtering (Lecture 2)

Q2: Consider the source image shown in (a) and the filter kernel shown in (b). What is the resulting value at positions (0,0), (2,2) and (4,3) if you were to apply cross-correlation, convolution, and 3x3 median filtering, with the use of zero-padding on the borders? Positions are denoted as (row,column) in the unpadded image.

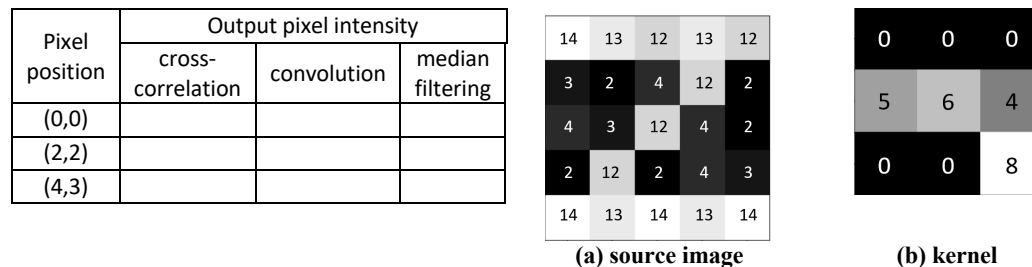


Figure 2

Coding (see CS4243-Tutorial-01.ipynb):

Basic Operations on Images (Lecture 1)

- Install basic python packages: `imutils`, `opencv-python`, `scikit-image`
- Load and display `House.jpg`
- Visualize the (R,G,B) channels; visualize the normalized colour and intensity images
- Convert RGB image into HSV colour space and visualize the (H,S,V) channels
- Resize an image such that the dimensions are 2X, 0.5X and 0.05X the original size

Operations on Images (Lecture 2)

- For `Capture.jpeg`
 - Visualize the image histogram
 - Access a pixel value: what is the pixel intensity of (100,800)
 - Access a window of data: crop out the stadium
- Write your own algorithm for histogram stretching and equalization. Visualize the resulting histograms and compare with the built-in `cv2.equalizeHist`¹.

Image Filtering (Lecture 2)

- Smooth image `Synthetic.png` with a box filter of size 5 and a Gaussian kernel of size 5 and a sigma of size 3.
- Smooth image `Building.png` with a box filter of size 30 and a Gaussian kernel of size 30 and a sigma of size 10.
- Apply 2D Laplace filter as described in L3 slide 25 to images `Synthetic.jpg` and `Sharpen.jpeg` and the smoothed versions from above

Past Quiz Questions:

- AY2021_Quiz1
- AY2122_Quiz1: Q1 to Q4

¹ https://docs.opencv.org/4.x/d5/daf/tutorial_py_histogram_equalization.html